



US005991542A

## United States Patent [19]

Han et al.

[11] Patent Number: 5,991,542

[45] Date of Patent: Nov. 23, 1999

[54] STORAGE VOLUME HANDLING SYSTEM  
WHICH UTILIZES DISK IMAGES[75] Inventors: **Byron B. Han**, Honolulu, Hi.; **James F. Kateley**, San Jose, Calif.; **Colm Murphy**, Tower Blarney; **Kenneth Fitzgerald-Smith**, Passage West, both of Ireland[73] Assignee: **Apple Computer, Inc.**, Cupertino, Calif.

[21] Appl. No.: 08/713,500

[22] Filed: Sep. 13, 1996

[51] Int. Cl.<sup>6</sup> ..... G06F 15/16

[52] U.S. Cl. .... 395/712

[58] Field of Search ..... 395/200.42, 200.45,  
395/200.47, 200.49, 200.33, 712, 200.77

## [56] References Cited

## U.S. PATENT DOCUMENTS

4,864,572	9/1989	Rechen et al. ....	371/2.1
5,001,628	3/1991	Johnson et al. ....	364/200
5,179,378	1/1993	Ranganathan et al. ....	341/51
5,230,052	7/1993	Dayan et al. ....	395/700
5,298,992	3/1994	Pietras et al. ....	348/415
5,325,532	6/1994	Crosswy et al. ....	395/700
5,353,061	10/1994	Rodriguez et al. ....	348/409
5,363,487	11/1994	Willman et al. ....	395/275
5,367,698	11/1994	Webber et al. ....	395/800
5,374,916	12/1994	Chu ....	340/146.2
5,394,534	2/1995	Kulakowski et al. ....	395/425
5,426,645	6/1995	Haskin ....	370/118
5,452,454	9/1995	Basu ....	395/700

5,493,649	2/1996	Slivka et al. .	
5,504,842	4/1996	Gentile .....	395/114
5,555,416	9/1996	Owens et al. ....	395/700
5,604,906	2/1997	Murphy et al. ....	395/712
5,778,384	7/1998	Provino et al. ....	707/200
5,838,910	3/1996	Domenikos et al. ....	395/200.33

Primary Examiner—Stuart S. Levy

Assistant Examiner—Kenneth W. Fields

Attorney, Agent, or Firm—Burns, Doane, Swecker &amp; Mathis, L.L.P.

## [57] ABSTRACT

Disk images, and the like, are used to emulate storage volumes for the distribution of computer software. An image of a data storage volume, such as a hard disk drive, is stored in a file having a format that enables it to exhibit a behavior which is the same as the storage volume itself. The image files are accessed by means of an associated driver which can support a variety of different file system protocols, thereby permitting the files themselves to be independent of the format requirements of particular file systems. The data in the image file can be compressed in a manner such that a storage volume being emulated appears to be of a specified size, while actually requiring less space to store its contents. With these properties, the image files can be mounted in the manner of a hardware storage device, and large files can be readily transmitted and downloaded in an electronic format. Since the files are preserved in their original form, end-to-end verification remains possible, to ensure the integrity of the downloaded files. Multiple images can be combined into a single tome, for installation at a remote site using a one-button approach.

20 Claims, 5 Drawing Sheets

